

# NOTES PRELIMINARY TO AN ACCOUNT OF CASSIA IN THE CHIHUAHUAN DESERT

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**ABSTRACT.** Descriptive and interpretive taxonomy of CASSIA (Leguminosae: Caesalpinioideae) of the Chihuahuan Desert, involving 6 nomenclatural transfers: CASSIA sect. **Earleocassia** (Britt.), C. sect. EARLEOCASSIA ser. **Tharpia** (Britt. & Rose), C. CROTALARIOIDES Kunth var. **vogeliana** (Schlechtd.), C. **pilosior** (Macbr.), C. WISLIZENI Gray var. **villosa** (Britt.) and var. **painteri** (Britt.); 5 new taxa: C. DEMISSA Rose var. **radicans** (Coahuila), C. **mensicola** (Coahuila to Hidalgo), C. DURANGENSIS Rose var. **iselyi** (s. Tex. to San Luis Potosi), C. **ripleyana** (trans-Pecos Texas to n. Zacatecas), C. **monozyx** (Coahuila); and 1 new epithet: C. **parralensis** (= *Chamaecrista goldmanii* Britt. & Rose).

In the course of revising *Cassia* for the *Chihuahuan Desert Flora* in preparation, we have encountered several undescribed taxa and the need for a few nomenclatural changes. These are presented in the framework of Bentham's classification of the genus (1871).

## I. Sect. EARLEOCASSIA (Britt.) Irwin & Barneby

CASSIA subgen. SENNA sect. **Earleocassia** (Britton) Irwin & Barneby, stat. nov. *Earleocassia* Britton in N. Amer. Fl. 24 (4): 247. 1930, pro gen.—  
Generitypus: *E. roemerana* (Scheele) Britt. = *Cassia roemerana* Scheele.  
CASSIA subgen. *Senna* sect. *Chamaefistula* ser. *Brachycarpae* Bentham in Trans. Linn. Soc. (London) 27: 529. 1871. — Sp. lectotypica: *C. roemerana* Scheele. — Non *Cassia* sect. *Chamaesenna* ser. *Brachycarpae* Bentham, op. cit. 552.

A well defined group of xerophytic cassias native to the Mexican Plateau, the Sonoran and Chihuahuan deserts, floristically related arid grasslands of southwestern United States, and tropical desert enclaves in south-central Mexico. The centers of diversification and abundance coincide within the Chihuahuan Desert, where 12 of the 18 described species are native and 5 endemic. The Brazilian *C. nana* Benth., still indifferently known, is provisionally excluded.

Characters common to all (or almost all) members of the section are: roots black in age; herbaceous stems dying back yearly usually to the ground; flaccid attenuate stipules; a complex vesture composed of short hairs, minute yellowish clavate ones, and stiffer longer setae; fusiform, often stipitate interfoliolar glands; a turbinate hypanthium heavily glandular about the torus; subequal obtuse sepals; petals expanded for 1 day, then wilting, fading



whitish when dried but coarsely arborescent-veined; and a pod, usually more or less turgid and internally septate, dehiscent downward along both sutures, the tips of the valves diverging to passively release the pear- or paddle-shaped seeds. Bentham considered his ser. *Brachycarpae*, of which he knew (disregarding *C. nana* and the probably also extraneous *C. mexicana* Jacq.) seven members, to form a transition between sect. *Chamaesenna* ser. *Corymbosae* and sect. *Oncolobium*, being close to the last in form, but not dehiscence, of the pod; different from both in the homomorphic sepals and from *Oncolobium* more decisively by want of the basal petiolar gland and lack of malodorous oils. The syndrome of characters listed, combined with a natural collective range of dispersal, characterizes a closely coherent and obviously natural group of species entitled to sectional rank within subgen. *Senna*. The chromosome number  $n = 14$  (in tetraploid *C. crotalarioides* Kunth,  $n = 28$ ) determined for 8 members of the section (Irwin & Turner 1960, p. 315) is the base number of subgen. *Senna*. In view of the fact that Bentham employed the epithet *Brachycarpae* for series in two different subgenera of *Cassia*, it seems preferable to take up at sectional level *Earleocassia*, proposed as a genus for an almost exactly conterminous group.

The monotypic genus *Tharpia* Britt. & Rose, consisting of the peculiar little subacaulescent *C. pumilio* Gray included in ser. *Brachycarpae* by Bentham, was said to differ from related segregates of *Cassia*, in particular from *Earleocassia*, in the want of a petiolar gland combined with subglobose, indehiscent pod. In reality, a petiolar gland, sometimes small and concealed between the narrow wings of the leafstalk, is consistently present, and the pod, now known to vary from subglobose to oblong, is tardily dehiscent downward from the tip, just as in other *Earleocassias*. The flowers and seeds of *C. pumilio* are essentially identical with those of *Earleocassia*, and in *C. ripleyana*, described below, we now have a species almost as dwarf, resembling *C. pumilio* in the scapiform, one-flowered peduncles and small turgid pod. Characters that remain peculiar to *C. pumilio* in context of its relatives are the tuberously thickened roots, the firm texture of the stipules and foliage, the thickened margins of the leaflets, and in particular the modification of the leaflets from asymmetrically oblong or obovate, cordate at base on the proximal side, to subsymmetrically linear-lanceolate, at base cuneate on both sides. We evaluate *Tharpia* as a monotypic series of sect. *Earleocassia*:

CASSIA subgen. SENNA sect. EARLEOCASSIA ser. **Tharpia** (Britton & Rose) Irwin & Barneby, stat. nov. *Tharpia* Britton & Rose in N. Amer. Fl. 23 (4): 246. 1930. — Sp. unica: *C. pumilio* Gray.

CASSIA CROTALARIOIDES Kunth var. **vogeliana** (Schlechtd.) Irwin & Barneby, stat. nov. *C. vogeliana* Schlechtd. in Linnaea 12: 342. 1838. *Earleocassia vogeliana* (Schlechtd.) Britt. ex Rose in N. Amer. Fl. 23 (4): 248. 1930.



Bentham (1871, p. 530) maintained *C. vogeliana* as akin to *C. crotalarioides* but different in the long spreading pubescence of stems and leafstalks combined with supposedly larger flowers. Britton & Rose (1 c.) relied for differential characters solely on vesture, and this indeed seems to be the only substantial difference. The collective range of the two entities encircles the southern margins of the Mexican Plateau from central Durango to Aguas Calientes and Guanajuato, thence east to Hidalgo, thence north along Sierra Madre Oriental to central Nuevo León. Along the segment of this great arc between Durango and Hidalgo the stem-pubescence is appressed or subappressed and composed of hairs mostly less than 1 mm long. From Hidalgo northward it becomes pilose and in extreme form shaggy-pilose with fine lustrous setae up to 3 mm long. Both types of vesture occur in Hidalgo (whence the type of *C. vogeliana*), and plants with occasional long spreading hairs scattered among the appressed ones form passage between the two.

CASSIA DEMISSA Rose var. **radicans** Irwin & Barneby, var. nov., a var. *demissa* caudice diffuse ramoso hinc inde radicanti, caulibus annotinis elatioribus (1-3.5 nec 0.8 usque dm longis), cauliumque pube hirsutula recedens. — MEXICO. Coahuila: s.-w. end of Sa. de la Fragua, 1-2 km n. of Puerto Colorado, 2. IX. 1941 (fl, fr), *I. M. Johnston 8774*.—Holotypus, TEX.

Hillsides and canyons, in izotal and chaparral, upward into the pinyon woodland, 1400-2100 m, strongly calciphile, scattered in the mts. of centr. and s. Coahuila from Sa. de la Madera s. through Sas. de Fragua and de Organos to Sa. de Parras and mts. s.-e. of Saltillo; apparently disjunct in extreme s.-w. Tamps.

Material seen: Coahuila: Sa. de Madera, *I. M. Johnston 9082* (TEX); *ibid.*, Cañón de la Hacienda, *Hendrickson 11874, 13567* (TEX). Sa. de Organos, 62 air miles w.-s.-w. of Cuatro Ciénegas, *Henrickson 12156* (TEX). s. of Parras, *Stanford & al. 229* (NY); S. S. José del Refugio, *Chiang & al. 8267B* (NY); Saltillo, *Gregg 244* (NY); 17 mi. s.-e. of Saltillo, *Bierner & Turner 86* (NY, TEX).

Britton & Rose (1930, p. 284) knew *C. demissa* only from the plants collected by Pringle in 1889 near (probably east of) Carneros Pass in extreme southern Coahuila. Precisely comparable material has been encountered since then only within a narrow circumference of the type station: once close by at Fraile (*Stanford & al. 253*); once in adjoining Zacatecas (*Chiang & al. 7938*); and once in the Sierra Madre Oriental near Pablillo (*M. Taylor 153*). Northward in Coahuila, from a line connecting Sierra de Parras and Saltillo by way of General Cepeda northward to Sierras de Madera and La Fragua, the species is represented by the coarser, taller form described as var. *radicans*, different from var. *diffusa* in its openly branched, often adventitiously rooting caudex, hirsutulous pubescence of the stems, and usually ampler, always more coarsely pilose foliage. The oldest known collection of var. *radicans*,



*Gregg 244* from near Saltillo in 1848/9, was mistakenly referred by Bentham (1871, p. 530) and by Britton (in hb.) to *C. vogeliana* Schlechtd., a species similar in gross aspect but with 4-5, not 2 pairs of leaflets. One flowering specimen from the southwestern corner of Tamaulipas (*Stanford & al.* 829, NY) is provisionally referred to var. *radicans* but may yet prove to represent a distinct form. It resembles the Coahuilan plants in general habit, but is notable for some very long spiral hairs on the upper stems, suggesting the shaggy pilose vesture of the genuine *C. vogeliana*, vicariant southward in the Sierra Madre.

**CASSIA pilosior** (Macbride) Irwin & Barneby, stat. nov. *C. bauhinioides* var. *pilosior* Robinson ex Macbride in Cont. Gray Herb. n. ser. 59: 27. 1919. — “TEXAS: Bofecillos Mts., Sept. 1883, *Harvard*, no. 14. . . . MEXICO: *Torreón*, Coahuila, Oct. 13-20, 1898, *Palmer*, no. 455; 75 miles southwest of Parras, Coahuila, May, 1880, *Palmer*, no. 2132.” Lectoholotypus (Isely, Leg. U.S. II. Subfam. Caesalpinioideae, ms.): *Harvard 14*, GH.

*Cassia durangensis* sensu B. L. Turner, Leg. Tex. 74, map 35. 1959; sensu Correll & Johnston, Man. Vasc. Pl. Tex. 788. 1970.

Confusion of *C. pilosior* with genuine *C. durangensis* Rose started with Britton's account of *Earleocassia* (Britt. & Rose, 1930, p. 248) and has been perpetuated in the Texan literature. The two species are certainly close allies, but upon examination of material taken throughout their ranges are found to be differentiated by the following syndrome of characters:

- a. Weak spiral hairs up to 2-4 mm present on upper stem and leafstalks; sepals marcescent about the forming pod; style filiform, 2.5-3.2 mm long, 0.2-0.25 mm diam; fl. small, the petals 8.5-10 mm; ripe pod strongly compressed, the septa between seeds very narrow (to 0.3 mm wide); seeds smooth; trans-Pecos Texas to n.-e. Durango and s. Coahuila. . . . . *C. pilosior*
- a. Longer hairs mostly less than 2 mm, setiform (some long spiral ones in distantly allopatric var. *iselyi*); sepals promptly deciduous at anthesis; style 1-2 mm long, 0.3-0.4 mm diam; fl. variable in size, but where nearly allopatric with *C. pilosior* larger, the petals 10-13 mm; pod turgid, the septa broader; seeds strongly rugulose; bicentric in dispersal, var. *durangensis* local around margins of Mapimí depression in s.-e. Chihuahua and e. Durango, var. *iselyi* on the Gulf Coastal Plain in extreme s. Texas and Tamaulipas. . . . . *C. durangensis*

The known range of *C. pilosior* extends from the Rio Grande valley in Brewster and Presidio counties, Texas, south to the periphery of the Mapimí depression in southwestern Coahuila, eastern Chihuahua, and immediately adjoining Durango. In the lower Nazas valley southwest of Torreón *C. pilosior* and *C. durangensis* var. *durangensis* have been collected within a radius of a few kilometers of Cuencamé (*Irwin 1231, 1234*) but despite essential sympatry are there sharply marked.



CASSIA DURANGENSIS Rose var. *iselyi* Irwin & Barneby, var. nov., a var. *durangensi* vix nisi pedunculis pauci (1-3, nec 2-5)-floris necnon glandula petiolaris sessili glaberrima (nec stipite villosulo elevata) recedens sed patria valde remota separanda. — MEXICO. Tamaulipas: San Fernando à Jimenez [Santander], X.1830 (fr) *J. L. Berlandier 840*. — Holotypus, NY; isotypus, K.

Mesquite thickets and along roadsides and canal banks of the Gulf Coastal Plain below 300 m, in sandy or sandy loam soils, lower Rio Grande valley in extreme s. Texas (Zapata, Starr, Hidalgo, Cameron cos), s. through Tamaulipas just into San Luis Potosí.

Representative: UNITED STATES. Texas, Zapata: Zapata, 14.XI.61 (fr), *Cabrera & Munoz 50* (TEX). Starr: road to McCook, 9.X.54 (fr), *Tharp & M. C. Johnston 541888* (TEX). Hidalgo: Lomita Alta, 18.VI.37 (fl), *C. E. R. Cameron 30* (TEX). Cameron: Olmito, 15.X.36 (fl), *R. Runyon 2992* (TEX). MEXICO. Tamaulipas: Río Purificación, 7 mi. n. of Padilla, *Hagee & Kerr 1059* (SMU); Río Blanco to Victoria, *Karwinski in 1842* (LE); Victoria, *Berlandier 2260* (K, NY). San Luis Potosí: Salto de Agua, mun. Cd. del Maíz, *Shott & Drewe 54* (SMU).

While one of the earliest collections (*Berlandier 2260*, NY) of var. *iselyi* was correctly referred by Britton (in hb.) to *C. durangensis*, modern collections, especially those from southern Texas, have passed, surprisingly, as *C. bauhinioides*, although fundamentally different in the broad leaflets, cylindrical style, and straight pod. It differs, in fact, only very slightly from genuine *C. durangensis* of the Chihuahuan Desert in its glabrous sessile petiolar gland and usually 1-2, rarely 3-flowered peduncles. The dispersal of the two varieties is remarkable, var. *durangensis* being known from the upper forks of the Conchos and Nazas rivers in southeastern Chihuahua (n.-e. of Parral) and eastern Durango at elevations of some 1400-1570 m, whereas var. *iselyi* is confined to the Gulf Coastal Plain below 300m. A hispidulous ecotype of *C. bauhinioides*, distinguished by its very small, sometimes cleistogamous flowers and prevailing 1-flowered peduncles is the only *Earleocassia* known to enter the edge of the range of var. *iselyi*, reaching Starr and Zapata counties in the Rio Grande valley (*Runyon 1719, 2605*, TEX) and northern Nuevo León (*Ripley & Barneby 13252*, NY). This, however, with the narrow leaflets and dilated style of its species, is probably not truly sympatric with var. *iselyi*, occurring in Texas on gravelly hilltops and in adjacent Mexico on the calcareous first bench of Sierra Madre, apparently never straying out onto the sandy and loam soils of the Coastal Plain proper.

The variety is named for our friend Duane Isely, distinguished student of Leguminosae, who first recognized the distinct character of the taxon in relation to the polymorphic *C. bauhinioides*.

CASSIA **mensicola** Irwin & Barneby, sp. nov. inter *C. bauhinioidem* A. Gray et *C. roemerianam* Scheele quasi intermedia, illam habitu simulans sed floribus majusculis (petalis 11-18 nec 6-10 mm longis), stylo exacte cylin-



drico 0.2-0.3 mm tantum diam, necnon seminibus laevibus cito extricanda, ab hac, quoad florum magnitudinem stylique forma praesimili, imprimis statura minori (caulibus 0.5-2, rarius 2.5 dm usque, nec 2-7 dm longis) foliolis minoribus oblongo-ellipticis obtusis pro rata latioribus (2-3 nec 4-9-plo longioribus quam latis), patriaque procul aliena abstans. — MEXICO. San Luis Potosí: Charcas, VII-VIII. 1934 (fl, fr), *C. L. Lundell 5345*. — Holotypus, CAS; istotypus, LL, TEX.

Loosely caespitose perennial herbs, in habit resembling *C. bauhinioides*, the mostly simple, incurved-ascending stems 0.5-2 (2.5) dm, these and the leaf-stalks pilosulous with short subretorse and minute yellow clavate hairs mixed with a few coarser ascending setae to 0.4-1 mm, the leaflets (dry) ashen beneath, golden-green above, pilosulous both sides, the axillary, few-flowered racemes short-exserted. Leaves (2-) 2.5-5 (-5.5) cm; stipules lance-caudate 4-8 mm; petioles 1-2.7 cm; intrafoliolar gland slenderly fusiform acute, including the often puberulent stipe 0.8-1.5 mm; leaflets 1 pair, narrowly oblong or oblong-elliptic obtuse, minutely mucronulate, (10-)12-37 X 3-11(-12) mm, mostly 2-3 times longer than wide; peduncles 2-4(-4.5) cm; racemes (1-)2 (-4)-flowered, the axis 0-11 (-15) mm; bracts 2.5-4.5 mm; pedicels 4-9 (-12) mm; sepals narrowly elliptic to elliptic-obovate obtuse, (5-) 5.5-8.5 (-9.5) X 2.2-3.6 mm; petals yellow drying whitish, broadly oblanceolate to obovate-cuneate, 11-16.5 (-18) X 6-11 (-12) mm, arborescently 3-veined from claw; androecium of *C. bauhinioides*; style slenderly cylindric 1.4-2.8 X 0.2-0.3 mm; ovary pilosulous; ovules 34-42. Pod linear-oblong, usually a trifle incurved, 2.3-3.5 X 0.35-0.55 cm, moderately turgid, the valves at once densely minutely puberulent and setose with ascending hairs to 0.9-1.2 mm, the cavity narrowly septate; seeds paddle-shaped, 2.2-2.5 mm, the testa bluntly folded and ridged but otherwise smooth or almost so, dark lustrous brown.

Gravelly clay flats and hillsides, in desert or desert grassland, sometimes on roadsides, mostly, perhaps exclusively calciphile, 990-2300 m, Meseta Central of n. Mexico from upper Moctezuma valley in n. Hidalgo (Ixmiquilpan) n. through San Luis Potosí and adjacent Zacatecas to s.-e. Coahuila.

Representative: COAHUILA: 15 km w. of Concepción del Oro, 19.VII.41 (fl), *Stanford, Wetherford & Northcraft 500* (NY); s. of Saltillo, 29.VII.29 (fl), *R. Runyon 1338* (NY, TEX). Zacatecas: w.-n.-w. of Tecolotes on road to Coapa, 17.VI.72 (fl), *Chiang, Wendt & Johnston 7895* (NY); e. of Troncoso 6.IV.70 (fl), *Mahler 5757* (SMU). SAN LUIS POTOSI: San Luis Potosí and vicinity, 2.IX.02 (fr), *Pringle 9728* (NY), in 1879, *Perry & Palmer 206* (NY), *Schaffner 624/831* (NY). HIDALGO: Ixmiquilpan, VII.05 (fl), *Rose Painter & Rose 8999* (NY, US), *Purpus 1370* (NY).

Five collections of *C. mensicola* known to Britton in 1930 were referred by him to *C. bauhinioides*, and modern ones have generally been so identified, following the key to *Earleocassia* in *North America Flora*. The two species, although widely separated geographically, are indeed similar in stature and foliage, but *C. mensicola* differs in the conspicuously larger flower, the syl-



indric style, and the smooth seeds. Its flower is essentially like that of the probably more closely related *C. roemerana*, but this differs in the greater stature (stems mostly 2.5-7, not 2-2.5 dm), in the longer, proportionately narrower and more acute leaflets (4.5-9.5 not 2-3 times longer than wide), which are in consequence of their length, at least in all upper leaves, more and not less than twice as long as their petiole. The range of *C. mensicola*, a very natural one extending over the southern part of the Chihuahuan Desert province southward from the Coahuila-Zacatecas boundary at approximately 25° N. into Hidalgo, is fully disjunct from that of *C. roemerana*, a species common over Edwards Plateau, trans-Pecos Texas, and desert segments of the Pecos and Rio Grande valleys in New Mexico, which extends south only feebly into Mexico, in Coahuila to near 28° and along the east piedmont of Sierra Madre Oriental to near 26° N. in Nuevo León.

**CASSIA ripleyana** Irwin & Barneby, sp. nov., inter affines sect. *Earleocassiae* foliolis 1-jugis signatas legumine breviusculo turgido inter semina late septato *C. bauhinioidem* A. Gray spectans, sed habitu pumilo caespitoso, pedunculis (plerisque 1-, paucis raris 2-floris) scapiformibus, styloque elongato filiformi apice haud dilatato, necnon seminibus laevissimis (nec rugulosis) recedens. MEXICO. Chihuahua: arid calcareous flats,  $\pm$  1400m, 18 km w. of Jiménez (27° 5' N, 105° 10' W), 2.X.1965 (fr), *H. D. Ripley & R. C. Barneby 13,904*.—Holotypus, NY.

Dwarf, laxly caespitose, subacaulescent perennial herbs from woody taproot and (when adult) a pluricipital caudex, pilosulous throughout with coarser, forwardly incurved-ascending hairs less than 1 mm and a few weak spreading filiform ones to  $\pm$  2-2.5 mm, the 1 pair of leaflets ashen beneath, greener above, silky-pilosulous both sides. Stipules erect, narrowly linear-caudate (4-) 6-10 mm, strongly 1-nerved, the filiform glabrescent tips often recurved. Leaves 1-5 cm; petiole stiff but subfiliform, 1-2.5 (-3.2) cm; intrafoliolar gland linear-claviform 0.7-2.4 mm; leaflets oblong- to obliquely obovate-elliptic, obtuse mucronulate or subapiculate, (6-) 8-20 X 3 -10 mm, at base broadly cordate on proximal and cuneate on distal side. Peduncles stiffly erect or in age declined, 2.5 cm, 1 (-2)-flowered; bracts triangular-subulate 1-1.5 mm; pedicels 5-8 mm; buds nodding, obtuse, pilosulous. Sepals 5.5-6.5 mm, the outer elliptic-ob lanceolate, the inner obovate, all membranous-margined; petals yellow (whitish when dry) not widely expanding, all spatulate-ob lanceolate, short-clawed, 8.5-9.5 X 5-6 mm, arborescently 3-veined from claw; androecium of *C. bauhinioides*; ovary densely pilose; style 3-3.5 X  $\pm$  0.3 mm, filiform-cylindric; ovules 18-28. Pod in outline oblong-ob lanceolate, straight or slightly incurved, (13-) 15-24 X 5-8 mm, abruptly subulate-beaked, turgid, the ripe valves papery, brown, hispidulous with coarse, basally dilated ascending setae up to 0.7-1 mm, dehiscent downward through both sutures, the valves narrowly gaping to release the seeds. Seeds paddle-shaped,  $\pm$  2-3.5 mm, the testa olivaceous or pinkish-brown, smooth,



lustrous.—Fig. 1.

Gravelly hilltops and flats in arid grassland and Larrea desert,  $\pm$  1400-1660 m, local within the borders of the Chihuahuan Desert from trans-Pecos Texas (Glass Mts., Brewster Co.) to s.-e. Chihuahua near Bolsón de Mapimí (w. of Jiménez; Rancho La Gloria) and extreme n. Zacatecas (Cedros), not yet collected but to be expected in n. and w. Coahuila.

Material seen: UNITED STATES. Texas. Brewster: Glass Mts., 13.VII.40 (fl, fr), Warnock W-44 (TEX); s. 1., 9.X.36, *Tharp s. n.* (CAS, in part, mixed with *C. bauhinioides*). MEXICO. Chihuahua: Sa. del Diablo 14 km s.-e. of Rancho La Gloria, 29.VIII.72 (fr), *Chiang & al. 9000d* (TEX). Zacatecas: n. of Cedros, 22.IX.73 (fl, fr), *Reveal & Atwood 3357* (NY, US).

A neat little cassia related to *C. bauhinioides* but readily distinguished by the tufted habit, the wiry scapiform peduncles, and the lustrously smooth olivaceous to pinkish-brown seeds. The subacaulescent growth-form and relatively stiff stipules recall *C. pumilio* Gray, but the oblong-obovate, basally semicordate leaflets are entirely different.

Named in memory of Harry Dwight Dillon Ripley, 1908-1973, an avid collector and eclectic devotee of small and rare desert plants, who in the field noted of the type-collection: "near *C. bauhinioides*, but not the same."

## II. Section CHAMAESENNA Bentham

The genus *Palmerocassia* Britt. (1930, p. 253), based on *Cassia wislizeni* A. Gray, consisted in the first instance of five species, endemic to desert regions of Mexico and immediately adjoining United States. They are twiggy, subspinescent, microphyllous shrubs and treelets with glandless leafstalks, large flowers, the androecium and tardily dehiscent, compressed pod of sect. *Chamaesenna* Benth., forming in Bentham's scheme of classification a xerophytic offshoot of the *Eglandulosae* series. An interesting feature of the group is the dimorphic foliage, an adaptation to desert climate achieved by many Leguminosae of different groups. The leaves of the current season are solitary, but subtend in their axil a compressed-conical bud which, lying dormant the first year, develops during the second into a brachyblast, taking the form of a fascicle of small leaves intermixed with setiform stipules.

Three of Britton's five *Palmerocassias* are almost or quite confined to the Chihuahuan Desert, but are so closely related that they may best be interpreted as geographic varieties of a widespread *C. wislizeni*; their differential characters appear in the key following. The perhaps also closely related *C. pringlei* Rose, differing in the often more flexuous branches and greatly elongated pod (18-29 not 8-16 cm long) represents this complex in the Balsas Depression and low valleys of Oaxaca; while *C. unijuga* Rose, locally endemic in southern Puebla, is well marked by the combination of villous pubescence and unijugate leaflets with revolute margins. A parallel reduction of the leaflets to one pair has occurred also in the Chihuahua Desert, described below as *C. monozyx*. The members of the group occurring in our range are





Fig. 1. *Cassia ripleyana* Irwin & Barneby. Habit X1; sepals + petal (ventral view) X2; ovary and seed X5.



separable as follows (Fig. 2):

1. Leaflets 2-6 pairs (*C. wislizeni*, sens. lat.)
  2. Pubescence of young branchlets, leafstalks, and (if present) of leaflets appressed or forwardly subappressed.
  3. Stipules of primary leaves persistent; leaflets of primary leaves mostly 3 pairs, the largest 3-10 mm long, on lower (or both) faces coarsely penninerved; s.-e. Chihuahua (Sas. del Diablo, Hechiceros, Encinillas) and Chihuahua Desert n. from middle Conchos valley to Rio Grande valley in trans-Pecos Texas (Hudspeth, Jeff Davis, Presidio cos), the adjoining s. corners of New Mexico and Arizona, and thence w. to the Magdalena valley in n. Sonora. . . . 1a. *C. wislizeni* var. *wislizeni*
  3. Stipules of primary leaves caducous; leaflets of primary leaves 3-5 (-6) pairs, the larger ones 5-15 mm long, the venation of the lower face not or scarcely elevated, commonly immersed; Chihuahua Desert, s. and s.-e. from n.-w. Zacatecas and extreme s. Coahuila to n. Querétaro, e. feebly into s. Nuevo León and extreme s.-w. Tamaulipas. . . . 1c. *C. wislizeni* var. *painteri*
  2. Pubescence of young branchlets, leafstalks, and leaflets spreading, villosulous; leaflets in number, size, and venation as in var. *wislizeni*; local around edge of Mapimí Depression in extreme s.-w. Coahuila and adjacent Durango. . . . 1b. *C. wislizeni* var. *villosa*
1. Leaflets 1 pair; w.-centr. and s.-centr. Coahuila. . . . 2. *C. monozyx*

CASSIA WISLIZENI A. Gray var. **villosa** (Britton) Irwin & Barneby, stat nov. *Palmerocassia villosa* Britton in N. Amer. Fl. 23 (4): 254. 1930.

CASSIA WISLIZENI A. Gray var. **painteri** (Britton) Irwin & Barneby, stat. nov. *Palmerocassia painteri* Britton in N. Amer. Fl. 23 (4):254. 1930.

CASSIA **monozyx** Irwin & Barneby, sp. nov., *C. wislizeni* Gray arcte affinis imprimis foliis 1 (nec 2-3)-jugis primo intuitu absimilis, a *C. unijuga* Rose pube sparsa appressissima vel subnulla (nec copiosa molli patula) patriaque aliena distat.—MEXICO. Coahuila: limestone ridge, 1800 m, Valle Seco in Sierra da la Paila, mun. General Cepeda, 7.VI.1944, *G. Hinton* 16565.—Holotypus, NY.

Erect, stiffly branched, subspinescent shrubs to 1 m, the old trunks fuscous glabrous, the young branchlets strigulose with appressed hairs to 0.25 mm, early glabrate, the foliage glabrous or the leaflets thinly strigulose dorsally. Leaves solitary only on young branchlets, mostly fasciculate from knotty brachyblasts, 5-15 mm; stipules setiform, 1-4 mm, persistent; petiole (1-) 1.5-5 mm; leaflets 1 pair obovate or cuneate-obovate, 3-9 (10) mm, at apex commonly apiculate, rarely retuse and mucronulate, the blades stiffly chartaceous, yellow-green or glaucescent, the midrib and 3-5 (-6) pairs of secondary veins prominulous both faces. Racemes loosely 1-4-flowered, axillary to reduced upper leaves, forming a small panicle, the axis often shorter



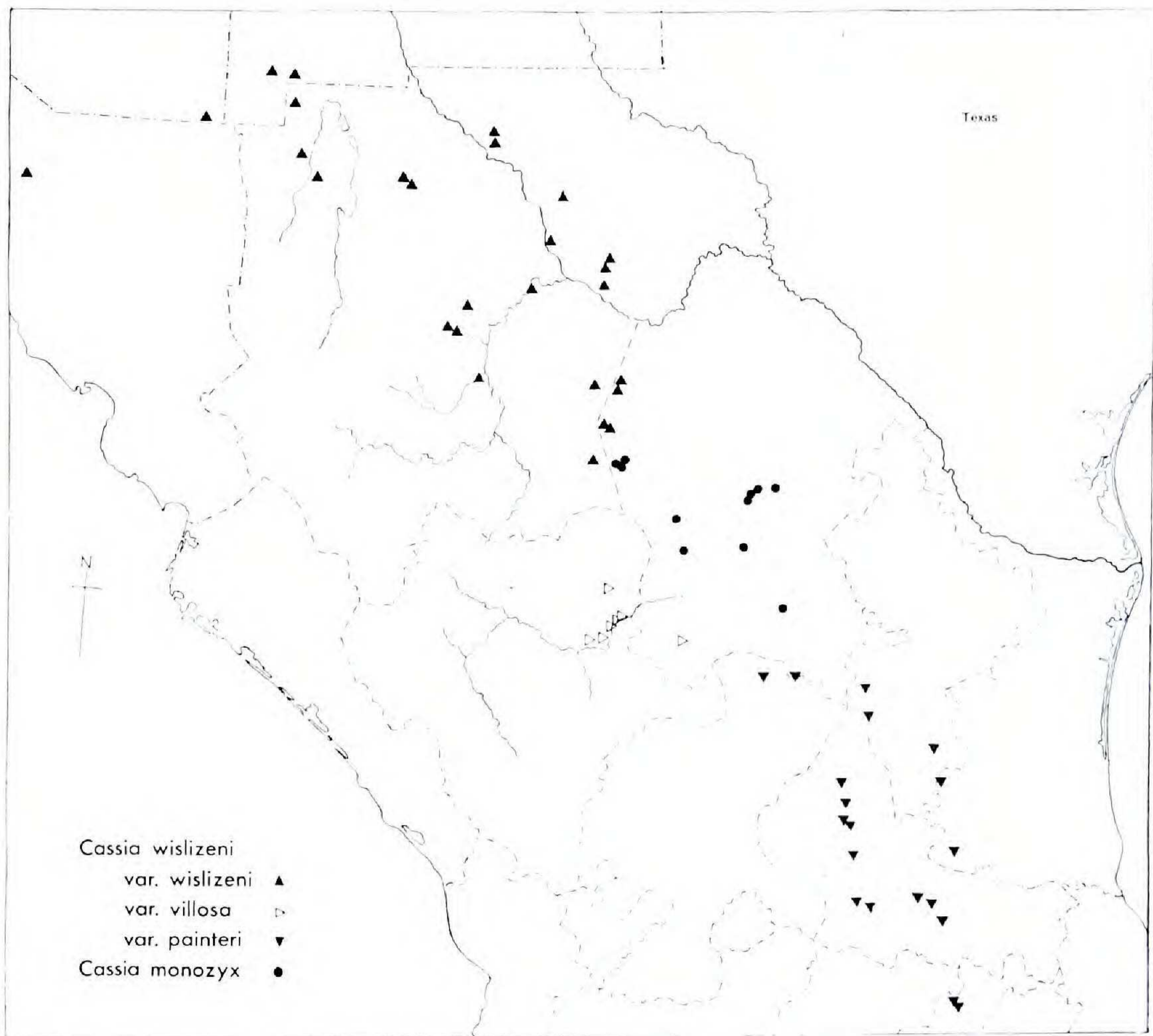


Fig. 2. Distribution of *Cassia monozyx* and the varieties of *Cassia wislizeni*.

than the flexuous pedicels; buds globose, except for the minutely ciliolate sepals glabrous; sepals oblong-elliptic to suborbicular obtuse, 4.5-7 mm, petaloid-margined; petals yellow, the largest  $\pm$  18-20 mm; ovary glabrous; ovules  $\pm$  10-15; pod linear, 6-10 X 0.65-0.8 cm, contracted at base into a short stipe, the purplish-nigrescent lustrous valves expressed over the rhombic-compressed, dull brown seeds.

Gravelly clay slopes of bajadas and canyons at and near base of calcareous mountains, 750-1500 m, w.-centr. to s.-centr. Coahuila (Sa. Mojada e. to Sa. de la Madera, s. to Sa. de la Paila).

Material seen: COAHUILA. Sa. Planchada n. of Esmeralda, 16.VIII.40 (1vs), *Johnston & Muller 343 (TEX)*. Sa. Mojada s. of Esmeralda, 1.IX.72 (fl, fr), *Chiang & al. 9066 (NY)*. Cañón de Calabazas in Sa. Mojada, 6.v.73 (fl), *M. C. Johnston & al. 10883 (NY)*. Sa. de la Madera 8 km w. of Cuatro Ciénegas, 5.VIII.73 (fl), *M. C. Johnston 12084F (NY)*. 13 km s.-w. of Cuatro Ciénegas, 11. VI. 72 (fl), *Chiang & al. 7633 (NY)*. Cuatro Ciénegas, 23.VIII.39 (fl), *E. M. Marsh 2060 (TEX)*. 7 mi. w. of Sacramento on road from Mon-



clova to Cuatro Ciénegas, 12.VI.55 (fl), *M. C. Johnston 2584A* (TEX). Sa. de Organos 62 km w.-s.w. of Cuatro Ciénegas, 8.VIII.73 (fl, fr), *Hendrickson 12170b* (TEX). n.-w. of Las Delicias, 29.VIII.71 (fl), *Henrickson 6098b* (TEX). Sa. de los Alamitos 11 mi. n. of Australia, 13.VI.72 (fl, fr), *Chiang & al. 7723* (TEX).

Closely akin to *C. wislizeni* Gray and *C. unijuga* Rose, in habit and details of flower and fruit resembling both, but different from the first in the constantly bifoliolate leaves, those of the primary branchlets and secondary short-shoots being essentially alike, and from the latter in the sparse appressed, not copious and villous pubescence of the young stems and foliage, and in the smaller, firmer, more veiny, non-revolute leaflets. The two bifoliolate species, *C. unijuga* and *C. monozyx*, are widely separated geographically, the former being endemic to the Tehuacán Desert in Puebla, the latter to a small segment of the Chihuahuan Desert in Coahuila, distant 900 km apart. The accompanying map shows the vicariant dispersal of *C. monozyx* and *C. wislizeni* with its varieties which together form a replacement series occupying virtually the whole floor of the Chihuahuan Desert.

### III. Sectio CHAMAECRISTA Bentham emend. Irwin

**CASSIA parralensis** Irwin & Barneby, nom. nov. *Chamaecrista goldmanii* Britton & Rose in N. Amer. Fl. 23 (5): 285. 1930. Non *Cassia goldmanii* Rose (1906).

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